FACTORS INFLUENCING ANTIBIOTIC PRESCRIBING CHOICE AMONG PRIVATE GENERAL PRACTITIONERS IN WINDHOEK

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HILENI PHILLIPS

200715798

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Supervisor: Dr. Washington Shumba (UNAM)

Co-Supervisor: Mr. Desderius Haufiku (UNAM)

ABSTRACT

Background: Inappropriate prescribing of antibiotics by physicians has been implicated as the driving force behind antibiotic resistance posing a major threat to public health. This study aimed to determine the factors influencing antibiotic prescribing among private general practitioners in Windhoek.

Method: A quantitative, descriptive cross-sectional research design method was used. A total of 71 private general practitioners in Windhoek completed the questionnaire. Data were collected from May to June 2022 and analysed using SPSS version 26 software.

Findings: The patient-doctor relationship was found to influence antibiotic prescribing majorly. While 68% of the participants indicated fear of the patient developing a severe infection. The Namibian standard treatment guidelines and advice from medical representatives were also found to affect prescribing behaviour. Lastly, a positive correlation ($p < 0.05$) was found between participants being pressured to prescribe antibiotics and their location of practice, fear of losing patients due to lack of antibiotic prescription, and the number of patients seen per day.

Conclusion: This study uncovered correlations between the factors and the demographic characteristics of the participants. These results indicate that antibiotic stewardship programs and interventions may have to be tailored to accommodate specific groups such as the age of physicians, location of practice, and the number of patients seen per day.

Keywords: antibiotic prescribing, antibiotics, general practitioners, treatment guidelines, descriptive cross-sectional study

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LIST OF ABBREVIATIONS AND ACRONYMS

DDD	Defined Daily Doses
GMP	Good Manufacturing Practices
GP	General Practitioner
MoHSS	Ministry of Health and Social Services
MRs	Medical Representatives
NAMAF	Namibia Association of Medical Aid Funds
NemList	Namibia essential medicine List
NMRC	Namibia Medicines Regulatory Council
NSTG	Namibia Standard Treatment Guidelines
PGP	Private General Practitioners
UTI	Urinary Tract Infection
WHO	World Health Organization

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Firstly, I would like to thank God, my heavenly father for his faithfulness, grace, and love. Psalms 115:1, Not to us, Lord, not to us, but to your name be the glory, because of your love and faithfulness.

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To my mother, Ms. Helena Benhard, thank you for your encouragement and support. I hope I made you proud.

DEDICATION

I dedicate this piece of work to my late father Mr. Phillip Mateus. I know you would have been proud of the woman I have become. Rest in peace Dad.

I also, dedicate this paper to my brother Erasmus Tsiimi – your support and encouragement motivated me through this journey. God bless you!

DECLARATION

I, Hileni Phillips, hereby declare that this study is my own work and is a true reflection of my research, and that this work, or any part thereof has not been submitted for a degree at any other institution.

Hileni Phillips		October 2023
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Name	Signature	Date

CHAPTER ONE

INTRODUCTION

1.1 Introduction of study

Antibiotics are considered the most crucial, lifesaving drugs for treating bacterial infections worldwide (1). However, antibiotic resistance has reduced their effectiveness to treating common bacterial diseases causing an increase in morbidity and mortality rates (2). There is consensus in the literature on the relationship between the misuse of antibiotics, inappropriate antibiotic prescribing, and antibiotic resistance (2-4). Inappropriate antibiotic prescribing and misuse are cited as a global problem affecting developed and developing countries (1,5).

Physicians play a significant role in the use of antibiotics, because in most countries' prescriptions are required for antibiotic usage (5-7). Additionally, they make the final decision on whether to use antibiotics and which antibiotic to prescribe. For this reason, it is vital to identify how physicians prescribe antibiotics (4). Studies have looked at various factors influencing antibiotic prescribing.

A Spanish study indicated the fear of complications, complacency with patients, and insufficient knowledge as the reasons behind antibiotic prescribing by general practitioners (8). In another study low levels of knowledge about antibiotic prescription in primary care facilities were connected to high levels of antibiotic prescription from patients with URTI in Hubei, China (4). In Africa, a Nigerian study on determinants of antibiotic prescribing among doctors in an urban hospital found that 97% of the doctors were influenced to prescribe antibiotics by drug promotional and marketing activities (2). While in Namibia, a study found no correlation between

the antibiotic prescribing practices of physicians and their age, location, or the number of patients seen per day (3). In contrast, other studies reported more patients seen, resulting in high antibiotic prescriptions (9-12). There are different viewpoints on the factors influencing antibiotic prescribing in the literature that appear to be country or region specific.

However, there is little or no information regarding the factors influencing antibiotic prescribing in Namibia. Therefore, the current research paper aimed to determine the factors influencing the antibiotic prescribing choice of private general practitioners in Windhoek.

1.2 Background of study

Antibiotics were discovered in 1928 by Alexander Fleming and were first used clinically during the 1940s; since then they have revolutionized the treatment of bacterial infections worldwide (13). These drugs are known to be one of the most cost-effective, lifesaving drugs that contribute considerably to extended life expectancies (14). However, the high usage of these drugs has led to high consumption rates and antibiotic resistance (4). Reports show a dramatic increase in global consumption rates from 21.1 Defined Daily Doses (DDD) in 2000 to 64.4 DDD per 1000 inhabitants per day in 2015(1,15). Much of this increase in consumption rates may be attributed to inappropriate antibiotic prescribing by physicians (16).

Various studies have supported the idea of worldwide increase in antibiotic consumption and misuse. The United States of America shows a 30% increase in outpatient antibiotic prescriptions with up to 50% of these scripts being inappropriately prescribed (4). While in Africa, Tanzania is one of the countries reported to have high antibiotic consumption at 27.3 DDD/1000/day in 2016 (1). Similarly, Namibia's

antibiotic consumption rate is at 27 DDD/1000/day with a 3.5% increase between 2008 and 2011 (15,17). Understanding the factors influencing physicians' choice to prescribe antibiotics should be a vital prerequisite for promoting proper use of antibiotics, reducing consumption rates, and limiting resistance (9).

A study assessing the prevalence and treatment outcomes of multiple antibiotic prescribing in Lesotho found that 51% of the healthcare providers were influenced majorly to prescribe antibiotics even if the diagnosis was unclear; In comparison, 53% would prescribe a second-class antibiotic if the hospital pharmacy did not have stock of the first-class antibiotic (6).

Finally, they conclude that attitudes and perceptions of healthcare providers on antibiotic prescribing and the use of laboratory tests in making a diagnosis may have negative impacts on antibiotic prescribing. Furthermore, it is reported that physicians prescribe antibiotics empirically due to fear of the patient developing a more severe infection (16). Also, practitioners may prescribe newer antibiotics to meet patient expectations, believing that a newer antibiotic provides better efficacy (9). Meeting patients' expectations was apparent in a study by Butler et al. who found that practitioners prescribed antibiotics for upper respiratory tract infections because these patients expected to be treated with antibiotics. They further report that such consultations took about two minutes to complete (18).

In Namibia, a retrospective study on antibiotic use and resistance patterns found that private doctor's antibiotic prescription choices were in line with neither the Namibian standard treatment guidelines (NSTG) nor the local laboratory data for all presented infections. This might be because the available treatment guidelines limit physicians' scope of treatment since various necessary antibiotics had no therapeutic indications

mentioned in the NSTG (19). Furthermore, Namibia has no comprehensive antibiotic policy, guidelines, formulary, or antibiograms to regulate the use of antibiotics, with only the Namibian Standard Treatment Guidelines hosting a limited section on antibiotic use (19).

Thus, it is unclear what informs physicians' decision to prescribe antibiotics in Namibia. It is against this background that this study aimed at determining the factors influencing antibiotic prescribing choice among private general practitioners (PGP) in Windhoek.

1.3 Statement of the problem

In Namibia, the private health sector reports high antibiotic usage of 26.8 DDD/1000/day; this was found during a four-year study (2013-2016) on antibiotic resistance patterns (17). Over the course of this four-year study, a 25% increase in antibiotic usage was observed (17).

Alongside such high consumption of antibiotics, Namibia has limited regulations on antibiotic prescribing. There is no comprehensive antibiotic policy, antibiotic guidelines, antibiotic formulary, or antibiograms (19). Studies indicate the driving force behind antibiotic resistance to how these drugs are being used; too many antibiotics are being misused threatening their usefulness (17,20). Hence, consolidated interventions are needed that target the behaviour of providers and patients (17).

Antibiotic prescribing within the public health sector is guided by the Namibia essential medicine List (NemList) and the Namibian Standard Treatment Guidelines (NSTG). On the other hand, antibiotic prescribing in the private health sector is less regulated (3). Thus, it is unclear what guides physicians' decision to prescribe antibiotics within the private health sector.

This study focused on private general practitioners, as several studies associate the high and inappropriate use of antibiotics with physicians' prescribing practices (20,15,21). In addition, antibiotic consumption rates were mainly found to be highest in the Windhoek suburb 34% (17). On that premise, the researcher was prompted to identify the factors that influence the Windhoek private general practitioner's choice in prescribing antibiotics.

1.4 Research Aim

The main aim of this study was to determine the factors influencing antibiotic prescribing choice and their association with demographic characteristics amongst private general practitioners in Windhoek. This has the potential to help develop data-driven national strategies for rational antibiotic prescribing and the development of Namibian antibiotic guidelines.

1.5 Research Objectives

1. To determine the factors influencing the antibiotic prescribing choice of private general practitioners in Windhoek
2. To determine the correlation between demographic characteristics and the factors influencing the antibiotic prescribing choices of private general practitioners in Windhoek

1.6 Significance of the study

This study provides valuable evidence-based information to the Ministry of Health and Social Services (MoHSS) on the factors influencing antibiotic prescription in Namibia. It also helped uncover the level of influence the Namibian Standard Treatment Guidelines has on the prescribers and may be used to motivate the expansion of these guidelines. The NSTG may be expanded to include more antibiotics used within the

private health sector of Namibia. In addition, the findings of this study create a baseline for strengthening existing measures that combat the misuse of antibiotics in Namibia. Furthermore, the results of this study may provide guidance to the MoHSS for the development of Namibia antibiotic guidelines. These guidelines will reduce the reliance of PGP on prescribing antibiotics for mild or self-limiting conditions in the community. Lastly, it is hoped that this study encourages PGP to practice effective symptom management by reducing the use of antibiotics for non-antibiotic symptoms and when necessary to choose antibiotics that will limit the development of resistance in the patient. At the practice level, it is hoped that this study inspires PGPs to take time and explain non-antibiotic management of symptoms to their patients.

1.7 Delimitation of the study

This study was focussed solely on private general practitioners consulting patients in Windhoek. The study considered only those practitioners registered with the Namibia Association of Medical Aid Funds (NAMAF). The study concept was to uncover the reasons behind antibiotic prescribing of private general practitioners.

1.8 Definition of key concepts

Consumption – In this paper, the term consumption is used to mean to "data on antibiotic use" (1).

Antibiotic use - The term antibiotic use refers to "antibiotics taken by the individual patient'' (1).

Defined Daily Doses – Defined Daily Doses refer to "the presumed maintenance dose per day of medicine taken for its main indication" (1).

Medical Representative – In this paper, a medical representative refers to "a person who promotes and sells antibiotics produced by pharmaceutical companies" (22).

1.9 Chapter Layout

This study aimed to determine the factors influencing antibiotic prescribing choice of private general practitioners in Windhoek. The thesis is divided into five chapters as follows:

Chapter one introduces the study, it also discussed the statement of the problem, research aim, objectives, and significance of the study.

Chapter two discusses the literature review and theoretical framework related to this study.

Chapter three outlines the research methodology and design that was employed to attain the objectives of this study. It gives an overview of the tools used to collect data, the sampling method, and the data analysis techniques used.

Chapter four this chapter presents the study results.

Chapter five provides a discussion of key results in relation to literature. In addition, chapter five presents the conclusions, limitations, and recommendations of the study.

1.10 Summary

This chapter presented the background of antibiotic prescribing and consumption in Namibia and worldwide. The research process including the statement of the problem, aim, objectives, significance, delimitations, and definition of key terms have been discussed to give an overview of the study. The next chapter will discuss the literature review and theoretical framework related to this study.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The purpose of this chapter is in three folds; the first is to review the literature on antibiotic prescribing by general practitioners, factors that are associated with the choice to prescribe antibiotics, and problems arising from inappropriate antibiotic prescribing. The second is to set the stage for the study by discussing the Namibia private health sector and regulatory system and how that can influence the appropriate use of antibiotics. Lastly, this review will discuss the physicians' decision to prescribe drugs theoretical framework and how the variables from this theory are used to determine the factors influencing antibiotic prescribing choice among PGPs in Windhoek.

2.2 Overview of private healthcare in Namibia

Namibia is a densely populated country with a total population of 2.5 million people according to the 2020 census and covers a surface area of 824 300 km2 (23). Namibia is classified as an upper-middle-income country, with high income inequality (24). In this country the healthcare sector is divided into two parts the private and public sectors; the private health sector consists of all providers and facilities offering healthcare services outside the public health system. The private health sector serves 18% of the population and is paid for by medical aid while the public sector serves the remaining 82% of the population (25). Despite this most healthcare practitioners are in the private health sector, 72% of the doctors and about 50% of the registered nurses (25). There are 844 private health facilities (hospitals, private clinics, pharmacies, and auxiliary services in the private health sector, accounting for 35% of total health expenditure (26). As shown in the table below the private sector has 590 private

general practitioners, of which 239 are registered with the Namibia Association of Medical Aid Funds (NAMAF) (27).

Table 2.1. Private versus public health workforce employment

Occupational category	Number Registered with the Health Professions Council of Namibia (PCNA)	Number Employed in the PUBLIC Health Sector	Percent (%) Employed in the Public Sector	Number Employed in PRIVATE Health Sector	Percent (%) in Private Sector
Dentist	174	40	23%	134	77%
Dental Specialist	7	-	0%	7	100%
Environmental Health Practitioner	218	139	64%	79	36%
Medical Officers	1,024	434	42%	590	58%
Medical Specialists	401	85	21%	316	79%
Registered Nurse	8,719	2,414	28%	6,305	72%
Enrolled Nurse	4,237	2,581	61%	1,656	39%
Occupational Therapist	81	23	28%	58	72%
Pharmacists	426	88	21%	338	79%
Pharmacist Assistant	156	156	100%		0%
Radiographer	203	64	32%	139	68%
Social Worker	462	146	32%	316	68%
Total	16,108	6,170	38%	9,938	62%

Table 2.1 above specifies the private and public health workforce (26). In Namibia, private health facilities and hospitals are regulated by the Hospitals and health facilities act 4 of 1994. The population serviced by the private health sector are part of a medical aid scheme and is formally employed. There are currently 10 medical aid funds in Namibia, which are regulated by the Namibia association of medical aid funds. NAMAF is established in terms of the Medical Aid Fund Act, 1995 (Act 23 of 1995) to control, promote, encourage, and coordinate the establishment, development, and functioning of the medical aid funds in Namibia (28).

2.3 Management of antibiotics in the private health sector of Namibia

The sale and use of all medicines in Namibia are regulated by the Namibian Medicine Regulatory Council and the Medicines and Related Substances Control Act, 13 of 2003. The act makes provision for the regulation and control of the use of medicines intended for humans and animals in Namibia. It maintains the medicines control council as the Namibia medicines regulatory council (NMRC) and supervise medicines' registration (29). The NMRC is concerned with the inspection, licensing, and compliance of all medicines and premises.

This involves ensuring conformity to good manufacturing practices (GMP) as outlined by WHO, GMP guidelines. Compliance verification involves the verification of medicines according to the Medicines and related substances act, 2003. This also includes the compilation of samples from distribution sites to ensure continued good standards after registration (30). NMRC ensures compliance with the law in terms of the use and sale of medicines, this entails inspection of pharmacies, dispensing medical practitioners, hospitals, and all health facilities. Finally, NMRC is concerned with liaising with customs officers by ensuring that only registered medicines are imported by licensed manufacturers, and inspecting general retail outlets to ensure that medicines are sold by authorized persons at authorized premises (30).

The Medicines and related substances act stipulate that antibiotics in Namibia are scheduled two medicines and hence can only be dispensed by a licensed pharmacist with a prescription by an authorized prescriber (29).

2.4 Analysis of antibiotic prescribing

When treating infectious bacterial diseases, prescribers must choose an appropriate antibiotic to ensure bacteriological eradication and clinical cure. The antibiotic should

make a difference to the patient's symptoms and, ultimately, their recovery (31). In most countries, antibiotics are only accessible via a prescription by a physician. However, a report on the drivers of the irrational use of antibiotics in Europe found that patients had access to antibiotics without a prescription causing major concern as this practice lacks proper diagnosis by a physician (14). Holloway (32) in her report on promoting the rational use of antibiotics states that in South- East Asia all countries permit the use of antibiotics over the counter (without a prescription). Plus, a minimal number of these countries have antibiotic surveillance programs.

The World health organization indicates that when choosing to prescribe an antibiotic, prescribers should be directed by local or national resistance surveillance data and treatment guidelines (33). They further assert that rational use of medicines is done when prescribers give the right medication, in the right dose, for the right clinical diagnosis at the right time (34). That way antibiotics do not predispose the patient to resistance. They remain accessible to treat conditions that may lead to disability or death (31).

There are several ways in which antibiotics may be prescribed. First, for prophylactic treatment, antibiotics are prescribed to prevent or minimize future infections in surgical cases. Surgical site infection is considered an enormous contributor to mortality; however, this can be reduced by administering antibiotics immediately pre- or post-surgery (35). Although, antibiotics are also used in prosthetic surgeries to prevent bacteria from attaching to the prosthetic devices' studies showed a low number of patients that acquired infection post-prosthetics surgery without prophylactic antibiotics (36,37).

Second, through empiric treatment which is the use of antibiotics directed at a particular infection without prior identification of the organism causing the infection (17). Empiric administration is based on selecting an antibiotic based on the presumed or suspected organism or source of infection (38). This is considered a lifesaving practice as compared to delayed antibiotic administration.

Finally, an antibiotic prescription may be guided by the type of organism and susceptibility of specific organisms to the antibiotic via laboratory tests or treatment guidelines (17). Rational management of infections prevents inappropriate treatment and resistance, allowing for focused treatment of an isolated and identified microbial pathogen. However, long laboratory waiting times may cause delays in treatment that can have devastating results (39). Rational antibiotic prescribing ensures that prescribers limit the overuse of antibiotics ultimately protecting the patient from resistance (11).

The widespread use of antibiotics and their success in treatment has dubbed them 'the most commonly prescribed drugs used in human medicine' (40). On the other hand, the high usage of these drugs has led to high consumption rates and antibiotic resistance (4). The global antibiotic consumption rate keeps rising, for example in 2015 it was reported to be between 4.4 to 64.4 DDD per 1000 inhabitants per day. This was reported among 65 countries registered for antibiotic surveillance globally by the World Health Organization (1). The global increase in antibiotic consumption is experienced in high-income and middle to low-income countries. The United States of America shows a 30% increase in outpatient antibiotic prescriptions, with up to 50% of these scripts being inappropriately prescribed (4). While in Africa, Tanzania is one of the countries reported to have high antibiotic consumption at 27.3 DDD/1000/day in 2016, Burkina Faso 13.8 DDD/1000/day and Côte d'Ivoire with 10.7

DDD/1000/day (1). Namibia's antibiotic consumption rate is at 27 DDD/1000/day, with a 3.5% increase between 2008 and 2011(15,17).

2.5 Consequences of inappropriate prescribing and antibiotic resistance

Antibiotics are crucial lifesaving drugs that prevent or treat infectious diseases caused by specific bacteria in humans, animals, and plants (41). They are vigorous chemotherapeutics that use their therapeutic effect to antagonize the growth of bacteria (42). Overprescribing and unnecessary use of antibiotics subject patients to resistant strains of bacteria making it harder to treat and sometimes leading to an extended hospital stay. Lushniak (43) in his study indicated that antibiotics are prescribed incorrectly up to 30-50% of the time, in terms of treatment indication, choice of, agent, and or duration of therapy. The same author further states that when antibiotics are prescribed unnecessarily it exposes the patient to potential complications of antibiotic therapy without any therapeutic effect.

Studies indicate that widespread and inappropriate use of antibiotics causes bacteria to become resistant, and prescribers have the most substantial effect on resistance due to their prescribing practices (20,4). Antibiotic resistance occurs in several ways, but the most common is through the transmission of plasmids via conjugation. Jason notes that "plasmids are loops of DNA that may contain multiple genes in them that encode for various processes (including antibiotic resistance), and they are highly portable" (44). Plasmids carry multiple resistant genes from one bacterial plasmid to the next, and with each act of genes swapping, a multiple-resistant bacterial strain is born (44). Hence the driving force behind antibiotic resistance is the way in which these drugs are being used (43,15).

There is consensus in the literature that high antibiotic consumption rates equal higher rates of antibiotic resistance. Also, the role of prescribers was identified as crucial in the way these drugs are used (45). This was evident during a study conducted in an outpatient setting in the USA where 30% of the antibiotics prescribed were found to be overprescribed (46). Similarly, in Namibia, an overall antibiotic prescription rate of 78% was found during a study conducted in the Katutura health centre for infections of the upper respiratory tract, tonsillitis, common cold, pharyngitis, and acute otitis media (47). Prescribers are important in controlling the inappropriate prescribing of antibiotics. In addition, they are most likely to prevent antibiotic resistance through rational antibiotic use in their prescribing practices and in the way they advise patients on proper antibiotic use (45).

2.6 Factors influencing physicians to prescribe antibiotics.

Preceding studies (14,9,48) have investigated some of the factors that are influencing physicians' choice in prescribing antibiotics.

2.6.1 The patient-doctor relationship

The patient-doctor relationship was identified as one of the most frequent reasons behind the prescription of antibiotics. A study in India found that primary care physicians prescribed antibiotics due to patient expectations to receive an antibiotic, the need to retain patients, and others to gain financially. Furthermore, they report that nearly all the cases of patient pressure led to the patient being prescribed the medication they expected (9). Similarly, the discomfort caused by patient pressure to prescribe was assessed. The patient-doctor relationship was found to have significant influence on prescribing decisions. When patients anticipate receiving antibiotics and the physician thinks that the patient is expecting them, they are ten times more likely to be prescribed (49). During another study in the Caribbean the physicians' treatment

decision on antibiotics was assessed and 21% of the participants reported prescribing antibiotics because the patient insisted on it (50).

On the other hand, during a study in Singapore, primary care physicians indicated that they do succumb to patient pressure to maintain a peaceful patient–doctor relationship. One of the doctors was quoted saying "we still partially belong to the service sector you know, so a lot of times I do have to admit that if patients ask for antibiotics and they are insistent, our threshold to reject them is very low" (51). Nonetheless, this study concluded that patient pressure to prescribe antibiotics might be reduced by the ability to make shared decisions with patients on antibiotics. This can be done by reducing patient load, increasing continuity of care, and ultimately building a trusting patient-doctor relationship (51). Lastly, the patient–doctor relationship is considered one of the most influential in terms of prescribing, physicians indicate that this is an emotional relationship and that what the patient thinks of the physician is more important (52).

2.6.2 Demographic characteristics

Physician demographics were found to influence antibiotic prescribing choice. This was apparent during a systematic review of qualitative studies on physicians' antibiotic prescribing behaviour. Previous clinical experience was discovered to be a factor influencing antibiotic prescribing in nine studies, and a positive correlation was found in two studies with previous clinical experience. Furthermore, they report two papers finding a direct link between university education and antibiotic prescribing while two more studies found no correlation. Medical specialization and sex were found not to influence prescribing (53).

In yet another study, workload was found to be a critical factor influencing antibiotic prescription. This was based on the number of patients seen daily and those seen weekly in emergency rooms both reported low-quality of antibiotic prescribing (54).

2.6.3 Pharmaceutical companies

Pharmaceutical companies are considered to influence prescribing decisions of physicians. In a study conducted by Anderson et al., 29% of the respondents indicated that they use Medical Representatives (MRs) often or almost always when deciding to prescribe, while 44% indicated using them sometimes. They also found that medical representatives had the greatest influence in private practice (55). India established that newer antibiotics were being prescribed on the recommendations from medical representatives one doctor was quoted saying: "The company MR gives only the good points of their products; they force doctors to write the newest antibiotic" (9). Equally, a study in Nigeria reported that over 97% of its respondents were influenced by drug promotional and marketing activities of the pharmaceutical industry to prescribe antibiotics (2).

Furthermore, a review of factors influencing the prescribing decisions by physicians found that the pharmaceutical industry, marketing, and promotion material are among the top three factors influencing prescribing decisions by physicians (56). Studies have also looked into why this is so; it was concluded that pharmaceutical companies influence the prescribing decision of physicians by creating a mutual benefit-based relationship (53,48). This exposure to the pharmaceutical industry and promotions is associated with increased prescribing frequency, higher costs, and decreased prescribing quality (14). In Namibia, the pharmaceutical industry was ranked as the second source of antibiotic prescribing data by 38% of respondents during a study conducted on prescribing practices for community infections (3).

2.6.4 National guidelines and policies

There is limited data on the influence of National guidelines and policies on antibiotic prescribing. This may be due to a lack of antibiotic guidelines and policies, or incomplete and limited guidelines as documented by the following studies. In China, a study on factors influencing antibiotic prescribing indicated that their national guidelines on antibiotic use are fragmented and incomplete (4). Likewise, the Namibian standard treatment guidelines are limited with several antibiotics not being listed for therapeutic indications. Furthermore, Namibia has no policy document specific to antibiotic use only the draft National Medicines Policy has a policy statement on antibiotic use (19).

2.6.5 Fear of the patient developing a serious infection

Among other factors physicians also expressed fear of patients developing a serious infection if not treated with antibiotics, workload, and the attitude and perceptions of practitioners towards antibiotic resistance (14,53,9). According to Kotwani et al., (9). physicians interviewed in their study indicated that they would prescribe an antibiotic even if the condition did not warrant one in case the viral infection becomes bacterial.

Furthermore, these physicians indicated prescribing antibiotics due to difficulty in early diagnosis, as most patients are reluctant undergo laboratory testing. Uncertainty of the progression of an infection just before a weekend was reported as the most significant factor for an antibiotic prescription when not indicated, by 44% of the doctors during a study on antibiotic prescribing behaviour in Germany (57). In addition, the following studies (52,58,59) specified fear of relapse, diagnostic uncertainty, and fear of secondary bacterial infections respectively as one of the major reasons behind physicians' antibiotic prescriptions.

2.6.6 Perception of physicians towards antibiotics and resistance

The perception of practitioners towards antibiotics and resistance is often expressed in their prescribing choices. This was true for a study conducted in Sweden showing how some general practitioners (GP) did not consider resistance as a problem they experienced in their everyday practice. A few others considered it as a problem but not affecting their practice rather as a problem found in other countries or different parts of the country and in hospitals. These GPs' knowledge and perceptions of antimicrobial resistance were mirrored in how they prescribed antibiotics for the treatment of UTIs (14).

2.7 The conceptual framework

Murshid et al. (60) suggests a value conceptual model that aims to uncover the many factors that lead to physicians' choice when prescribing drugs. The physician's decision to prescribe drugs conceptual framework combines three theories with different variables that are relevant to factors influencing prescribing decisions. Considering the literature, this conceptual framework is convincing. The agency theory analyses the relationship between interdependent parties to identify the problem that exists between them (60). This is relevant as it examines the relationship between the prescriber and the patient. In this theory, the patient-doctor relationship reigns supreme, the prescriber values and protects this relationship by assuming and complying with what the patient would like to be prescribed. As a result, the patient receives the prescription with the treatment, they assume they need (60).

Second, the theory of persuasion looks at how prescribing behaviour changes when the practitioner is subjected to stimuli. Pharmaceutical companies provide information to the prescriber, and the interaction between the medical representative and the

prescriber results in a modification of behaviour to prescribe the medication suggested by the medical representative through persuasion (60).

Furthermore, the theory of planned behaviour focuses on the prescribers' attitudes and behaviour. The attitude was perceived as the like or dislike of something which influences the tendency to prescribe. The variables that can alter behaviour are described as the drug's cost, the physician's trustworthiness in the pharmacist, the physician's habits, and perception of the drug (60).

Murshid et al. considered that physicians prescribing decision is multifactorial and not based on one single theory (60). That is the decision to prescribe and treat patients is based on several strategies employed by physicians. The following variables, the patient–doctor relationship, persuasion from medical representatives, and physician perceptions expressed in the physician's decision to prescribe drugs framework, were used to determine the factors influencing antibiotic prescribing choice among private general practitioners in Windhoek.

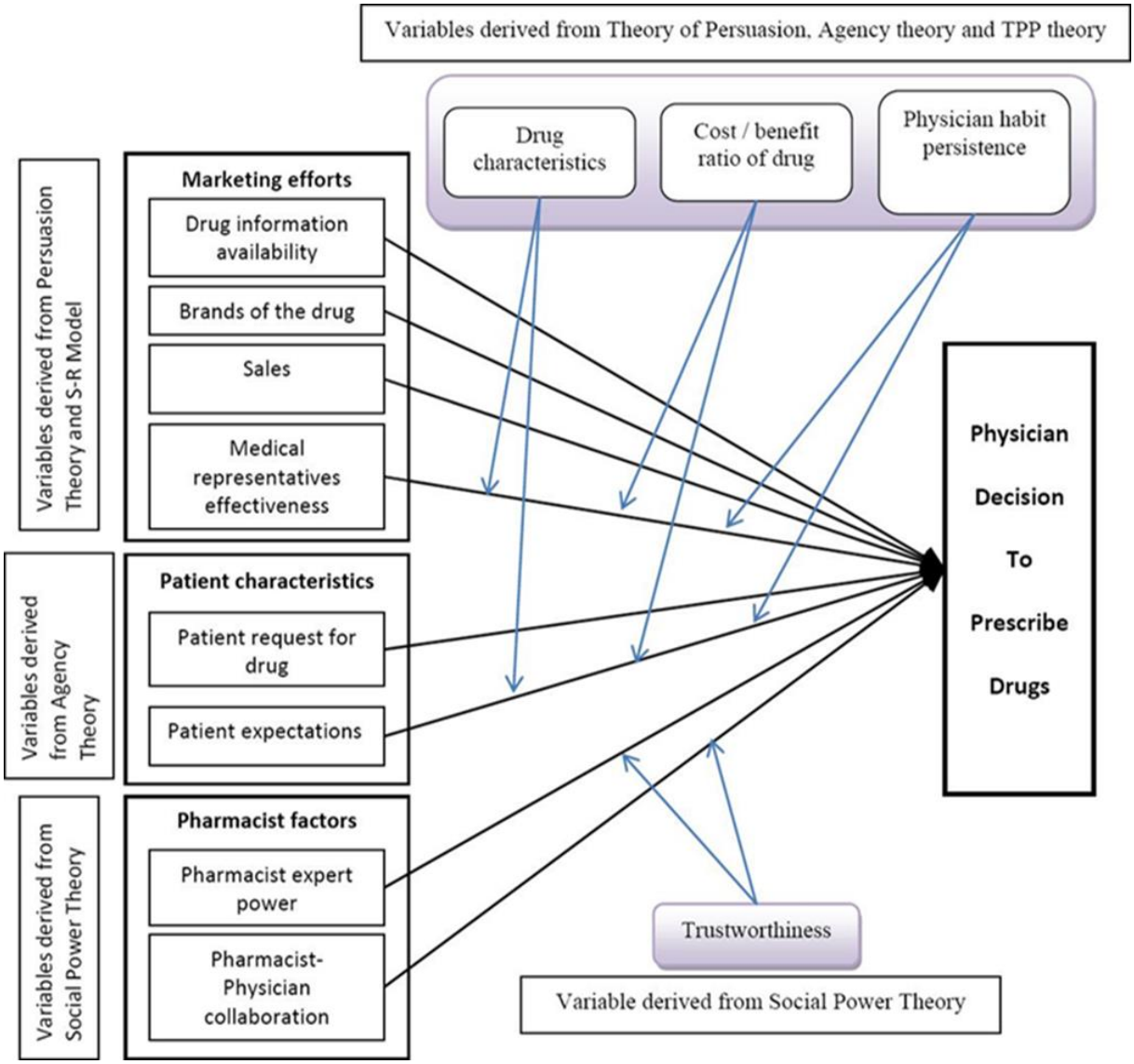

Figure 2.1. Physician decision to prescribe drugs conceptual framework (60)

2.8 Summary

This chapter provided literature on the overview of antibiotic prescribing, the consequences of inappropriate prescribing, and antibiotic resistance. It included a description of documented factors influencing physicians to prescribe antibiotics, an overview of private healthcare, and the management of antibiotics in the private health sector of Namibia. The conceptual framework underpinning this study was also described in this chapter. The following chapter will outline the research methodology and design employed to attain the objectives of this study.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This study aimed to determine the factors influencing antibiotic prescribing choice amongst private general practitioners in Windhoek. Chapter three presents the steps used to achieve the study objectives. It discusses a descriptive, cross-sectional quantitative study design, the population, sample size, research instruments, data collection methods, data analysis, and ethical considerations that were applied in this study.

3.2 Research Design

A research design is known as the 'blueprint 'of the study. It can be defined as an arranged way in which the researcher answers the research question (61). A quantitative descriptive cross-sectional research design was used to attain the study objectives. This study design was chosen to get an overview of the factors that lead private general practitioners to prescribe antibiotics in Namibia. This study design is concerned with gathering information from a representative population sample at one point in time (61). Hence the data was collected from 30th May 2022 to 30th June 2022 determining the factors influencing antibiotic prescribing amongst private general practitioners in Windhoek.

3.3 Research Methods

3.3.1 Study setting

The study was conducted in Namibia, Windhoek suburban areas at the PGP's consulting rooms. Alternatively, the PGP had a choice of completing the questionnaire virtually to allow flexibility. Based on the City of Windhoek Map, Windhoek suburbs

include, Katutura, Khomasdal, Otjomuise, Windhoek suburb, Dorado Park, Rocky Crest, Hochland Park, Pioneerspark, Prosperita, Kleine Kuppe, Olympia, Academia, Cimbebasia, Auasblick, Klein Windhoek, and Eros (62). The Academia and Cimbebasia suburbs were excluded because no PGPs were practising in those areas. Patients receive private primary healthcare services at the physicians' rooms, which are paid in cash or by claiming from medical aid.

3.3.2 Study Population

The study population is the group the researcher wishes to gather information about. This group should be defined according to person, place, and time (63). According to the Namibian Association of Medical Aid Funds, there are currently 239 licensed private general practitioners in Windhoek (64). They are distributed across the different Windhoek suburbs Katutura 38, Khomasdal 17, Otjomuise 3, Windhoek suburb 98, Dorado Park 5, Rocky Crest 2, Hochland Park 4, Pioneerspark 10, Prosperita 1, Kleine Kuppe 10, Olympia 13, Auasblick 3, Klein Windhoek 9 and Eros 36 (64). This study targeted both male and female PGPs with no limitations on age.

3.3.3 Sampling

In most studies it is usually not possible to study the entire population, therefore a sample of the population is studied, and inference is made to the total population hence the sample should represent the total population. A sample is defined as a group of people, objects, items, or units of analysis taken from the larger population for measurement. Study results can only be generalized if the sample accurately represents the total population (70).

The disproportionate stratified simple random sampling method was used to obtain a sample population for this study. Disproportionate stratified sampling involves

choosing participants by dividing the study population into strata or subgroups. Simple random sampling was then performed within each stratum to obtain the sample. Stratified sampling allows for a greater representation of the study population (61). The PGPs were divided into fourteen strata according to the physical address of their practice facility in Windhoek. The strata were selected based on the City of Windhoek Map including, Katutura, Khomasdal, Otjomuise, Windhoek suburb, Dorado Park, Rocky Crest, Hochland Park, Pioneerspark, Prosperita, Kleine Kuppe, Olympia, Auasblick, Klein Windhoek, and Eros (62). The Academia and Cimbebasia suburbs were excluded because no PGPs were practising in those areas. The following inclusion and exclusion criteria were applied:

Inclusion criteria

- Male and female private general practitioners, who have a registered private practice number and are consulting within Windhoek.

Exclusion criteria

- Private General Practitioners who are not registered with NAMAF and do not have a practice number.
- PGP's consulting outside the Windhoek suburbs.

3.3.4 Sample size

The appropriate sample size was selected from the 239 PGP in Windhoek.

The study sample size was obtained by using Yamane's formula for calculating finite populations (65).

Yamane Formula $n = \frac{N}{1+N(e)^2}$

Where:

n = is the sample size

N= is the population size

1= is the constant term

e= 5% margin of error calculated as 0.05

$$n = \frac{239}{1+239(0.05)^2}$$

$$n = \frac{239}{1.59}$$

n= 150

A sample population of 150 was selected from the 236 PGPs. Then using disproportionate stratified sampling, PGPs were divided into fourteen strata according to the physical address of their practice facility in Windhoek. The strata were selected based on the City of Windhoek Map including, Katutura 25, Khomasdal 11, Otjomuise 2, Windhoek suburb 61, Dorado Park 5, Rocky Crest 2, Hochland Park 2, Pioneerspark 6, Prosperita 0, Kleine Kuppe 6, Olympia 8, Auasblick 2, Klein Windhoek 6, and Eros 16 (62). The Academia and Cimbebasia suburbs were excluded because no PGPs were practising in those areas.

Table 3.1. Fraction contribution from each stratum to the total sample size calculated.

Strata	No. of PGP	Dispropotional fraction	Sample size
Windhoek	98	41	61
Katutura	38	16.8	25
Eros	26	10.8	16
Khomasdal	17	7.1	11
Olympia	13	5.4	8
Pioneerspark	10	4.1	6
Kleine kuppe	10	4.1	6
Klein Windhoek	9	4.1	6
Dorado Park	5	2	3
Hochland Park	4	1.6	2
Otjomuise	3	1.1	2
Ausblick	3	1.1	2
Rocky Crest	2	0.8	2
Prosperita	1	0	0
Total	**239**	**100**	**150**

A research randomizer was applied to randomly select participants from each stratum except for Rocky Crest and Cimbebasia suburbs with no practising PGPs (66).

3.4 Research Instrument

This section describes how the research instrument was developed and administered when collecting data for this study. A questionnaire was used to collect the data, this is a form completed by the participants in a study and returned to the researcher. The participant selects the answers to the questions and supplies primary personal or demographic data (67). A self-administered structured questionnaire with closed-ended questions was used to achieve the objectives of this study. In designing the research instrument, the following process was followed:

The questions were designed based on the objectives and aim of the study. Variables from physicians' decision to prescribe drugs conceptual framework were used to guide the questions in the questionnaire (60). Additionally, a literature review was conducted

to identify studies with similar objectives done elsewhere, the questionnaire from the study factors influencing prescribing decisions of physicians was used in the review and design of the data collection tool (56). This was done to ensure that the questionnaire level was equal to that of studies in the same field.

The questionnaire was designed to be clear, concise, unambiguous, and easy to understand. It comprised both open and closed-ended questions, which required short precise answers, for example: have you ever been pressured to prescribe an antibiotic by a patient even when it was not indicated?

☐ Yes ☐ No

If yes, what was the outcome? _____

The questionnaire had two sections: section one collecting demographic data and section two assessing the factors influencing antibiotic prescribing choice.

3.4.1 Pretesting of the research instrument

The questionnaire was pretested prior to data collection. Pretesting the questionnaire refers to the researcher surveying a small number of respondents from the original population to ensure that questions make sense and are easily understood (68). It allows you to straighten out any initial issues before conducting the actual study. The pretest was conducted on the 6th of May 2022, and five PGPs in Windhoek were asked to participate. Two of the PGP were offered the questionnaire via the link on google docs and the three were offered the questionnaire in hard copy. The PGPs were asked to comment on how long it took them to complete the questionnaire and whether they thought the questions were clear and understandable. The five PGP pretesting the questionnaire did not participate in the main study.

During the pretest it was found that all questions were clear except for question two, the last age group was incorrectly indicated as < 55 (smaller than 55) as opposed to > 55 (greater than 55). All PGPs in the pretest reported completing the questionnaire within 8-10 minutes.

3.4.2 Validity of the research instrument

Instrument validity determines whether an instrument accurately measures what it is supposed to measure within the context it is applied (61). In this study, two types of validity were considered namely content and face validity. Content validity is an assessment of how well items in an instrument represent all components to be generalized (69). To ensure content validity, the research instrument was designed according to variables identified in a previous study that share a similar aim (35). Additionally, variables from the physician's decision to prescribe drugs conceptual framework were used to ensure content validity.

Face validity is defined as the degree to which a tool appears to be related to variables of a specific construct (69). To ensure face validity the questionnaire was pretested and reviewed by the research supervisor to ensure that the questions were clear and representative of the objectives.

3.4.3 Reliability of the research instrument

Reliability of the research instrument refers to the degree to which a research instrument can yield consistent results (61). The reliability of the instrument was confirmed by pretesting the questionnaire, this ensured consistency in answering the questions. Pretesting of the questionnaire led to restructuring the age groups in question two. Furthermore, the research assistant was accompanied and observed by the researcher while collecting data during the pretest to ensure consistency.

3.5 Procedure for data collection

The data collection process for this study commenced after receiving approval from the University of Namibia (UNAM) research committee and MoHSS. The research assistant was trained on the purpose of the study, data collection techniques and ethical issues. The research assistant also signed a confidentiality document to ensure non-disclosure of research information.

Data was collected in Windhoek from 30th May 2022 to 30th June 2022 using a self-administered structured questionnaire. The research instrument did not use names or practice numbers to ensure confidentiality. Data was collected by the researcher with the help of the research assistant. The questionnaire was disseminated to 150 PGPs who consented to participate in the study. It was hand delivered to the participants consulting rooms and the same questionnaire was provided via a link (google docs) send via email. This was done to increase the number of respondents allowing for greater generalizability of results to the entire study population. At the end of each day where data was collected, the hand delivered, and online questionnaires were checked for completeness. The hand delivered forms were kept by the researcher in a locked storage while the online questionnaires were kept on the researcher's password protected computer.

3.6 Data Analysis

The data were transferred to Microsoft Excel for cleaning and coding. Data cleaning refers to the researcher checking the accuracy of the data, modifying data into groups, or combining information in a particular order (70). In contrast, data analysis is a process of categorizing, ordering, manipulating, summarizing data, and describing them in meaningful terms (61). Data analysis was carried out using Statistical Package for Social Sciences (SPSS) version 26 software.

Descriptive statistics were used to analyse both the demographic characteristics and the factors influencing antibiotic prescribing choices of private general practitioners. Demographic characteristics such as age, sex, location of the practice, and length of practice as a general practitioner were expressed using frequencies, percentages, and mean. Thereafter data was displayed on a table for visual presentation. The factors influencing the antibiotic prescribing choice of the participants were analysed using frequencies, subsequently, bar charts, and pie charts were also used to present these factors.

Finally, the Pearson correlation test was used to determine whether a statistically significant association exists between the demographic characteristics and the factors influencing antibiotic prescribing choice of the participants. The two-tailed t-test with a probability of $p < 0.05$ was used to present all statistical significance.

3.7 Ethical considerations

This study conformed to the principles of ethics in research. The ethical clearance for this study was obtained from the University of Namibia decentralized research ethics committee. The approval to conduct the research study was obtained from MoHSS. The following fundamental ethical principles were used to guide this research study:

3.7.1 The principle of respect for persons

The research participants were treated with consideration and respect for their human dignity (21). Participants were requested to partake in the study by completing a voluntary written consent form.

3.7.2 The principle of beneficence

The benefits of the research were maximized for the participants and the researcher was mindful of the time spent on the project by the participants. There was no inherent

risk brought to the participants (21). In addition, study participants were not put to any legal harm; however, the research results add to a body of knowledge that benefits the entire society. Participants spend about 10 -15 mins on the questionnaire they were allowed to determine the extent to which they shared information. Lastly, all participants were informed that the information collected was used for the purpose of the research study only.

3.7.3 The principle of Justice

The principle of justice ensures that participants are fairly selected for the study. The researcher and the participants agreed on their roles in the research project (21). The disproportionate stratified sampling method was used for this study to ensure the fair selection of the participants. The participants were provided with a document outlining their role and the researcher's role. Finally, the researcher provided her contact information to the participants for any support during the study.

3.8 Data storage

The quantitative data obtained was only used for the purposes of this study and stored on the researcher's password protected personal computer. The consent forms and questionnaires used to collect data in this study are stored in the researcher's lockable filing cabinet. The questionnaires used had no identifiable details of the participants, only their responses. SPSS version26 software was used in the analysis.

3.9 Data dissemination plan

The eventual research results and the thesis will be published through the University of Namibia Library Repository. It will also be made available to the office of the chief medical superintendent, Ministry of Health, and Social Services Windhoek. Further,

the researcher will publish the results of this study in journals and present them at workshops.

3.10 Summary

Chapter three presented detailed information used to achieve this research study's objectives. A quantitative descriptive cross-sectional research method was used as the study design. Furthermore, the following aspects were discussed: the study population, sampling and sample size, the development of the data collection instrument, pretesting of the instrument, validity, and reliability of the instrument used to collect data, the data collection procedure, data analysis and finally the fundamental ethical principles used to guide this research study. The next chapter will concentrate on the presentation of the study results.

CHAPTER FOUR

RESULTS

4.1 Introduction

This chapter aimed to present the study results using descriptive statistics and statistical analyses. Descriptive statistics were used to assess the demographic characteristics of the participants, such as age, sex, location of practice, and length of practice as a general practitioner. It was also used to summarize the factors influencing antibiotic prescribing choice of the participants. The Pearson correlation test was used to analyse the relationship between the demographic characteristics and the factors influencing antibiotic prescribing choice of the participants. The two-tailed t-test with a probability of $p < 0.05$ was used to present all statistical significance.

4.2 Demographic characteristics of the study participants

Table 4.1. Demographic characteristics of participants.

Demographic categories		Frequency	Percentage (%)	Mean
Gender	Male	46	64.8	1.35
	Female	25	35.2	
Age group in years	25-34	10	14.1	2.28
	35-44	38	53.5	
	45-54	16	22.5	
	>55	7	9.9	
Location of Practice	Windhoek suburb	29	40.8	2.89
	Katutura	18	25.4	
	Eros	3	4.2	
	Khomasdal	9	12.7	
	Olympia	5	7.0	
	Pioneers Park	2	2.8	
	Kleine Kuppe	3	4.2	
	Klein Windhoek	1	1.4	
	Dorado Park	1	1.4	
	Hochland	0	0.0	
	Otjomuise	0	0.0	
	Auasblick	0	0.0	
	Rocky Crest	0	0.0	
	Prosperita	0	0.0	
Work experience in years as a general practitioner	2-6	46	64.8	
	7-11	11	15.5	
	12-16	5	7.0	
	17-21	3	4.2	
	22-26	2	2.8	
	27-31	0	0.0	
	32-36	2	2.8	
	37-41	0	0.0	
	42-46	2	2.8	
	47-51	0	0.0	

A total of 71 private general practitioners participated in the study giving a response rate of 47%. Table 4.1 provides a summary of the participant's demographic characteristics. Among the 71 private general practitioners who completed the

questionnaire, 64.8% were male and 35.2% female with a mean age of 2.28 years. Most of the participants were from the Windhoek suburb 40.8% and the least represented suburbs were Dorado Park and Klein Windhoek with 1(1.4%) participant each. Work experience was expressed in the number of years as a general practitioner. More than half of the participants 64.8% had 2-6 years 'experience with only 2.8% having between 42-46 years' experience as a general practitioner.

4.3 Factors influencing antibiotic prescribing choice among private general practitioners in Windhoek.

4.3.1 Pressure from the patient to prescribe antibiotics.

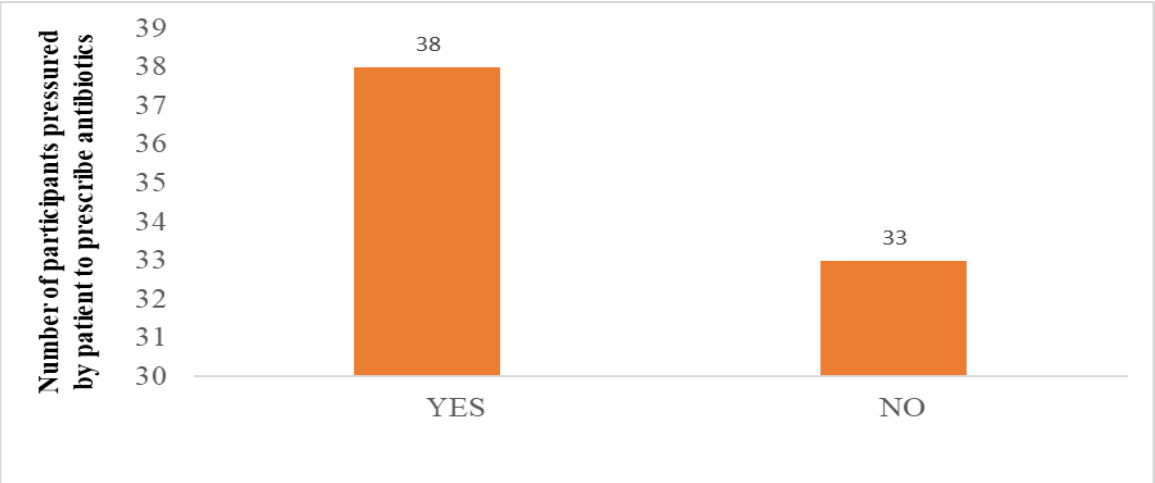

Figure 4.1. Number of PGPs pressured to prescribe antibiotics by the patient.

Figure 4.1 indicates the number of participants who felt pressurized to prescribe antibiotics by the patient even when it was not indicated. Most of the participants indicated feeling pressured by the patient to prescribe antibiotics.

Table 4.2. Location of practice and pressure to prescribe antibiotics.

Suburbs	Participants who felt pressured to prescribe antibiotics by the patient.
Windhoek suburb	17(44.7%)
Katutura	11(28.9%)
Eros	3(7.9%)
Khomasdal	5(13.2%)
Olympia	1(2.6%)
Pioneers Park	0(0.0%)
Klein Kuppe	0 (0.0%)
Klein Windhoek	0(0.0%)
Dorado Park	1(2.6%)
Total	**38(100.0%)**

Table 4.2 above provides a summary of the participants who felt pressured to prescribe antibiotics by the patient per suburb. The Windhoek suburb had the highest percentage of participants with 44.7% followed by Katutura with 28.9% and finally Khomasdal suburb with 13.2%.

4.3.2 Perception of antibiotics and resistance

Participants' perception of antibiotics and resistance was assessed by testing their thoughts on the causes of antibiotic resistance and whether they thought antibiotic resistance was a problem in Namibia and their practice. The tables below present the participant's results.

Table 4.3. Participants' perception on the causes of antibiotic resistance

		Over - prescribing	Under - prescribing	Misuse by patients	Use in animal husbandry
Responses	Yes	90%	11%	52%	25%
	No	10%	89%	48%	75%

According to table 4.3 above, most of the participants think that antibiotic resistance is because of overprescribing, 11% indicated under-prescribing, 37% misuse by patients, and 18% felt the use in animal husbandry caused antibiotic resistance.

Table 4.4. Antibiotic resistance as a problem in Namibia vs the physician's practice

	Antibiotic resistance a problem in Namibia	Antibiotic resistance as a problem affecting physicians' practice
Frequency (n)	63	59
Percentage (%)	88.7	83.1

Table 4.5. Correlation between antibiotic resistance a problem in Namibia and antibiotic resistance affecting the participant's practice.

	Antibiotic resistance in Namibia?	Antibiotic resistance in your practice?	Antibiotic prescription for a viral infection?
Antibiotic resistance in Namibia?	1		
Antibiotic resistance in your practice?	0.552**	1	
Antibiotic prescription for a viral infection?	0.077	.021	1

**. Correlation is significant at the 0.01 level (2-tailed).

Participants' perceptions toward antibiotic resistance were tested by asking whether they considered antibiotic resistance a problem in Namibia and whether they thought antibiotic resistance was a problem that could affect their practice. These results are expressed in table 4.4 above and show that 88.7% of the participants believe that antibiotic resistance is a problem in Namibia similarly 83.1% perceive it to be a problem that can affect their practice. The results in table 4.5 show a positive moderate relationship and is statistically significant ($r = 0.552$, $p<0.05$) between participants who think antibiotic resistance is a problem in Namibia and those that think it is a problem that can affect their practice.

4.3.3 Fear of losing patients due to lack of antibiotic prescription

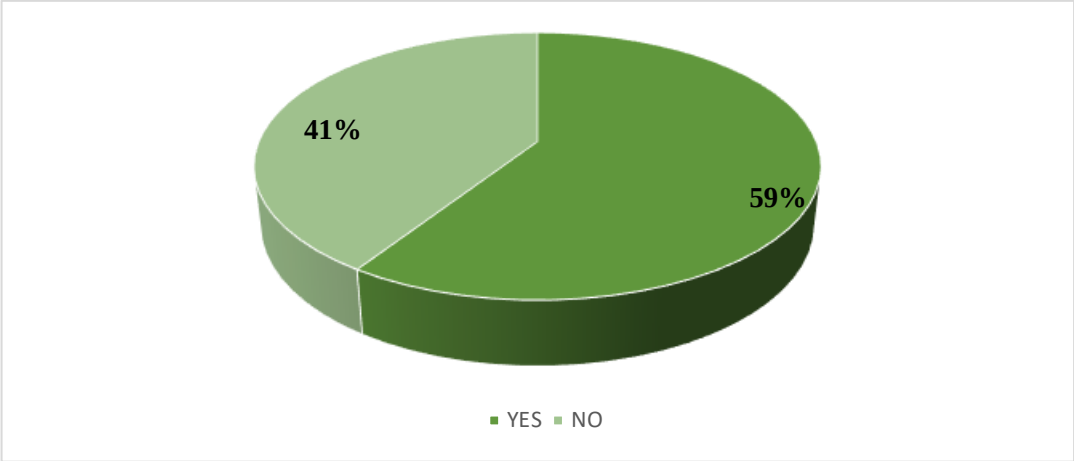

Figure 4.2. Fear of losing patients due to lack of antibiotic prescription

As shown in figure 4.2 above, the percentage of participants, who fear losing their patients due to lack of antibiotic prescription demonstrates that more than half 59% of the PGPs fear losing their patient if they do not provide them an antibiotic prescription.

4.3.4 Fear of the patient developing a serious infection if not treated with antibiotics.

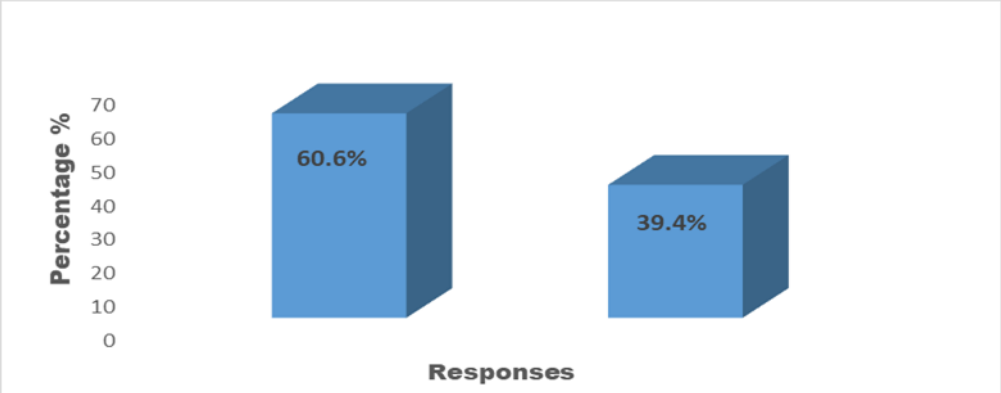

Figure 4.3. Participants who fear the patient developing a serious infection without an antibiotic prescription

Figure 4.3 above presents the percentage of participants who fear the patient developing a serious infection if they did not prescribe antibiotics for a viral infection.

Fear of the patient developing a severe infection was reported as a reason to prescribe antibiotics by 60.6% of the participants.

4.3.5 Prescription of antibiotics on the advice of medical representatives

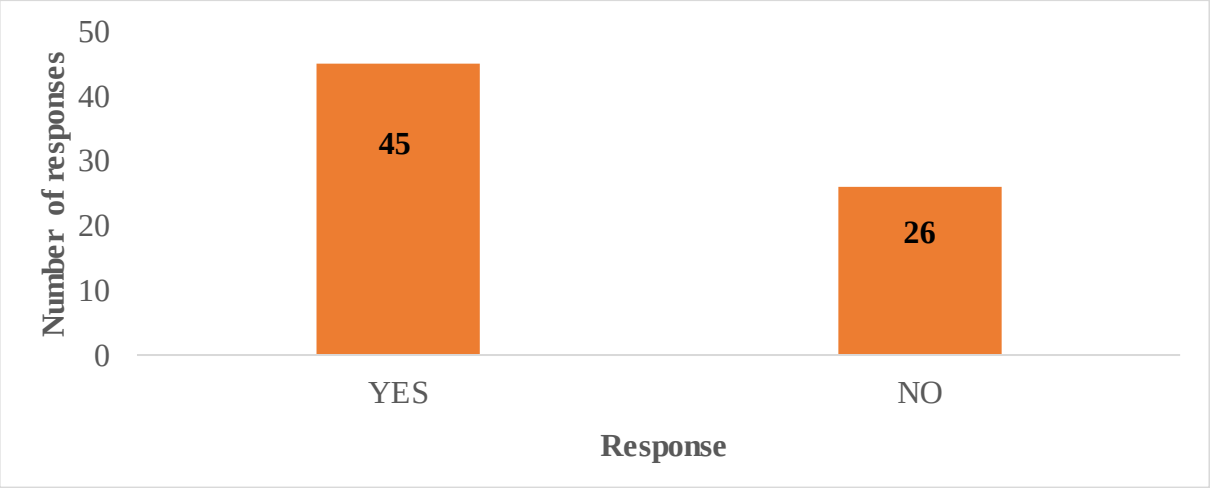

Figure 4.4. Number of participants prescribing antibiotics on the advice of medical representatives

Participants were asked whether they would prescribe antibiotics on the advice of a medical representative. Figure 4.4 shows that 45 participants (63%) indicated they would take the advice of a medical representative while 26 (36%) indicated they would not.

4.3.6 Influence of the Namibian standard treatment guidelines

Table 4.6. Participant's main source of information on antibiotics

Source of information	**Laboratory data**		**Namibian Standard Treatment Guidelines**		**Continuous Professional Development meetings**	
Responses	Frequency(n)	Percent (%)	Frequency(n)	Percent (%)	Frequency(n)	Percent (%)
	15	21	65	91.5	27	38

When assessing the influence of the Namibian standard treatment guidelines to prescribe antibiotics. Participants were asked what their main source of information on antibiotics was, 65% of them use the Namibian standard treatment guidelines as indicated in table 4.6 above.

4.4 The correlation between the demographic characteristics and the factors influencing antibiotic prescribing choice of PGPs

Table 4.7. Correlation of the demographic characteristics and the factors influencing antibiotic prescribing

	Pressured to prescribe antibiotics by the patient	Fear of losing patients due to lack of antibiotic prescription	Fear of the patient developing a serious infection, if not prescribed antibiotics for viral infection	Prescribe antibiotics on the advice of a medical representative	Influence from the NSTG to prescribe antibiotics
Gender	0.022	0.047	-0.109	-0.109	0.094
Age group	0.127	-0.041	-0.002	-0.002	0.264*
Location of Practice	0.244*	-0.150	-0.173	0.012	-0.103
Patients seen on average.	0.118	-0.211*	0.040	0.012	0.397
Work experience in years as a general practitioner	0.140	-0.009	0.198	0.017	0.017

*. Correlation is significant at the 0.01 level (2-tailed).

Table 4.7 above shows a summary of the Pearson correlation between participants' demographic characteristics and the factors influencing antibiotic prescribing. A positive low correlation that is statistically significant at ($r = 0.244$, $p < 0.05$) was found between participants who felt pressured to prescribe antibiotics and their location of practice. This shows that PGPs in certain Windhoek suburbs feel pressured to prescribe antibiotics by the patient. Additionally, a low negative correlation can be seen that is statistically significant at ($r= -0.211$, $p<0.05$) between participants who fear losing their patients due to lack of antibiotic prescription and the number of patients seen per day.

This implies an increase in participants who fear losing their patients due to lack of antibiotic prescription, leading to a low number of patients seen per day. Lastly, a positive low and statistically significant correlation was found between the demographic characteristic age group and the participants who indicated the Namibian standard treatment guidelines as their main source of information on antibiotics at ($r = 0.264$, $p< 0.05$). This means that the use of the Namibian standard treatment guidelines is related to the participants' age.

Table 4.8. Correlation of the demographic characteristics and the participant's perception of the cause of antibiotic resistance

	Gender	Age group	Location of Practice	Antibiotic resistance as a result of Overs-prescribing	Antibiotic resistance as a result of Under-prescribing	Antibiotic resistance as a result of Misuse by patients	Antibiotic resistance as a result of use in animal husbandry
Gender	1						
Age group	-.109	1					
Location of Practice	-.002	-.102	1				
Antibiotic resistance as a result of Over-prescribing	.053	-.113	.140	1			
Antibiotic resistance as a result of under-prescribing	-.017	-.148	.036	-.032	1		
Antibiotic resistance as a result of misuse by patients	.061	-.122	.009	-.222	-.015	1	
Antibiotic	-.045	-.076	-.025	-.024	.407**	.040	1
Resistance as a result of use in animal husbandry							

**. Correlation is significant at the 0.01 level (2-tailed).

Table 4.8 shows no correlation between demographic characteristics and participants' perception of antibiotic resistance. However, a moderate positive relationship at ($r = 0.407$, $p < 0.05$) was found between the participants' who perceive the cause of antibiotic resistance resulting from under-prescribing and animal husbandry.

4.5 Summary

The quantitative data collected for this study was presented in this chapter to answer two main objectives. To determine the factors influencing antibiotic prescribing choice of PGPs in Windhoek and to determine the correlation between demographic characteristics and the factors influencing antibiotic prescribing choices of private general practitioners in Windhoek. The study results were presented as figures and tables and the Pearson correlation test was used to analyse the relationship between variables at $p< 0.05$. Chapter five will provide the study's discussion, recommendations, and limitations.

CHAPTER FIVE

DISCUSSION, CONCLUSION, RECOMMENDATIONS, AND LIMITATIONS

5.1 Introduction

Chapter five discusses the study findings; recommendations are made based on the conclusions. In addition, the limitations encountered during the study are also highlighted in this chapter.

5.2 Discussion

The main aim of this study was to determine the factors influencing antibiotic prescribing choice amongst private general practitioners in Windhoek. A quantitative descriptive cross-sectional research design was used to attain the following study objectives. To determine the factors influencing antibiotic prescribing choice of private general practitioners and to determine the correlation between the demographic characteristics and the factors influencing antibiotic prescribing choice of private general practitioners in Windhoek.

A total of 71 private general practitioners participated in the study giving a response rate of 47%. The response rate was higher than that of the previous study conducted in Namibia amongst physicians registered with the local professional association (16). The distribution of participants corresponded well with the data provided by the Namibia Association of Medical Aid Funds which indicated the following distribution of private general practitioners in Windhoek: Katutura 38, Khomasdal 17, Windhoek suburb 98, Dorado Park 5, Pioneerspark 10, Kleine Kuppe 10, Olympia 13, and Klein Windhoek 9 (28).

The patient-doctor relationship is reported to influence the physician's prescribing behaviour significantly. In this study the patient–doctor relationship was assessed based on pressure to prescribe antibiotics by the patient and whether physicians fear losing their patient to another doctor if they do not prescribe antibiotics.

This study found that 53.5% of the practitioners prescribe antibiotics due to patient pressure. There is consensus in literature where a Caribbean study found 21% of the participants prescribed antibiotics because the patient insisted on it (50). At the same time, physicians in Singapore reported that they do succumb to patient pressure to maintain a peaceful patient–doctor relationship (51). Fear of losing the patient is another aspect of the patient-doctor relationship that influences physicians' prescribing choices. Due to fear of the patient moving to another doctor, patients are prescribed antibiotics to give the impression that the physician has come to a conclusion on what should be done (71). Fear of losing the patient is reported mostly amongst physicians in the private health sector, doctors do not practice the wait-and-watch policy because the patient will move to another doctor (9). More than half of the private general practitioners in this study feared losing their patients if they did not prescribe antibiotics.

The patient-doctor relationship is considered one of the most influential and often identified as the most common reason why physicians would prescribe antibiotics. Physicians indicate that this is an emotional relationship and that what the patient thinks of the physician is more important (52). Hence, the patient gets what they expect from the physician, and this was evident in another study where 97% of the physicians' prescribed antibiotics to their patients because they felt the patient expected the antibiotics (51). This demonstrates that the patient-doctor relationship greatly influences physicians' prescribing decisions of physicians and Namibia is no

exception. Most reports of patient pressure and fear of losing the patient appear to be within the private health sector; this is an unexplored phenomenon (9,51,72). Unnecessary prescribing of antibiotics can result in the rise of resistant bacteria causing a significant problem for public health. Fortunately, the physician's ability to make joint decisions with patients on antibiotics may reduce patient pressure to prescribe antibiotics, increasing continuity of care and ultimately building a trusting patient-doctor relationship (51).

This study also found a positive correlation between the location of practice and the private general practitioners who were pressured to prescribe antibiotics. This suggests that PGPs in certain suburbs are more pressurized to prescribe antibiotics. These suburbs were Windhoek suburb 40.8%, Katutura 25.4%, and Khomasdal at 12.7%. The above results correspond with the number of participants from the three suburbs Windhoek suburb had the highest number of participants 29, Katutura with 18, and Khomasdal with 9 participants. Hence, these results may be concluded to reflect the number of participants in those respective suburbs.

The perception of practitioners towards antibiotics and resistance is often expressed in their prescribing choices. Murshid et al. emphasizes that prescribers' attitude and perceptions towards a phenomenon will influence their behaviour (60). Private general practitioners in this study perceive antibiotic resistance as a problem in Namibia and one that can affect their practice. This perception was strengthened when 90% of the participants indicated overprescribing by physicians as the major cause of antibiotic resistance. Contrary to these results, a Swedish study showed most general practitioners did not consider resistance as a problem that can affect their practice but rather as a problem found in other countries or different parts of the country and in hospitals. The Swedish study concluded that these GPs' knowledge and perceptions of

antimicrobial resistance was mirrored in how they prescribed antibiotics for the treatment of UTIs (14). Consequently, it can be assumed that the perceptions of PGPs on antibiotic resistance found in this study are mirrored in their prescription of antibiotics. On the other hand, further research may also be necessary as doctors in Namibia were found to prescribe broad-spectrum antibiotics unnecessarily, favouring resistance (16).

Another factor influencing antibiotic prescription and expressed in literature is the fear of patients developing a serious infection if not treated with antibiotics (14,53,9). According to Kotwani et al. (9) physicians interviewed in their study indicated they would prescribe antibiotics for a viral infection in case the infection becomes bacterial. In addition, the following studies (52,58,59) specified fear of relapse, diagnostic uncertainty, and fear of secondary bacterial infections, respectively, as one of the major reasons behind physicians' antibiotics prescriptions. Similarly, the findings of this study suggest that fear of the patient developing a serious infection when not treated with antibiotics is one of the factors driving antibiotic prescription. The results show that 61% of the participants indicated prescribing antibiotics for a viral infection. In these cases, overtreatment with antibiotics was more favourable for physicians than practising delayed antibiotic treatment for viral infections.

Also, when determining the correlation to demographic characteristics no association was found between age, gender, location of practice, work experience, and fear of the patient developing a severe infection due to lack of antibiotic prescription. Hence interventions to combat the treatment of viral infections with antibiotics among private general practitioners may be generalized.

In the context of influence from a medical representative (a person representing a pharmaceutical company sent to convince the doctor to prescribe their medicine), the study revealed that 63% of the participants would prescribe antibiotics based on the advice of a medical representative. The same was true for a study conducted by Anderson et al. where 29% of the respondents indicated using medical representatives (MRs) often or almost always when deciding to prescribe.

Equally, in Nigeria, over 97% of respondents were influenced by drug promotional and marketing activities of the pharmaceutical industry to prescribe antibiotics (2). This study's results align with that of another study conducted among Namibian, doctors where the pharmaceutical industry was ranked as the second source of antibiotic prescribing data by the respondents (3). Medical representatives and pharmaceutical companies were found to have the greatest influence in private practice; they do this by creating a mutually-benefit-based relationship (53,55,48). The result is increased prescribing frequency of their medicine and decreased prescribing quality (14). This clearly indicates that pharmaceutical companies should be incorporated into strategies to fight inappropriate antibiotic prescribing.

This study found most of the participants use the Namibian standard treatment guidelines (NSTG) as their main source of information on antibiotics. However, Pereko et al. in their study, found that most respondents did not have a copy of the Namibian standard treatment guidelines (3). The discrepancy might be due to their study's low 10% response rate. Furthermore, there is limited data on the influence of national guidelines and policies on antibiotic prescribing in Namibia and other countries. This may be due to a lack of antibiotic guidelines and policies or incomplete and limited guidelines. For example, in China, a study on factors influencing antibiotic prescribing indicated that their national guidelines on antibiotic use are fragmented

and incomplete (4). The NSTGs are limited, with several antibiotics not listed for therapeutic indications (19).

In terms of association to demographic characteristics, this study found a statistically significant association between the age group and the participants who received most of their information on antibiotics from the Namibian standard treatment guidelines. This shows a gap in the literature that may illuminate the target age group when disseminating and enforcing the NSTG.

5.3 Conclusion

The following objectives were formulated to achieve the main aim of the research study; to determine the factors influencing the antibiotic prescribing choice of PGP in Windhoek and secondly to determine the correlation between demographic characteristics and the factors influencing the antibiotic prescribing choices of private general practitioners in Windhoek. The conclusion of this study is drawn based on these objectives.

5.3.1 To determine the factors influencing antibiotic prescribing choice of PGPs in Windhoek

This study uncovered a total of five factors influencing the antibiotic prescription of PGPs in Windhoek namely, the patient-doctor relationship, the perception of PGPs towards antibiotics and antibiotic resistance, fear of the patient developing a more serious infection, advice from medical representatives and influence from the Namibian standard treatment guidelines.

The patient-doctor relationship was assessed based on patient pressure and fear of losing the patient due to lack of antibiotic prescription. Most participants indicated they prescribe antibiotics due to patient pressure and fear of losing their patient to

another physician if they do not. These results were similar to that of studies conducted in other parts of the world. PGPs are recommended to take time and communicate non-antibiotic management of symptoms to patients. However, future research is also needed to investigate the time of perceived patient pressure during a doctor's visit whether before or after the diagnosis. Such information may assist in setting up communicative material to address patient pressure.

Pharmaceutical companies employ medical representatives to convince doctors to prescribe their medication. This may be alarming as 63% of the participants in this study indicated they do prescribe antibiotics on the advice of a medical representative. The number of antibiotics prescribed in the private healthcare industry must therefore be controlled more stringently. Additionally, pharmaceutical companies should submit investment strategies and policies to tackle inappropriate antibiotic prescribing when applying for licensing.

Murshid et al. emphasizes that prescriber's attitude and perceptions towards a phenomenon will influence their behaviour (60). Hence the PGP's perception of antibiotics and resistance is often expressed in their prescribing choices. This study revealed 88.7% of the participants thought antibiotic resistance is a problem in Namibia similarly 83.1% thought antibiotic resistance is a problem that can affect their practice. Moreover, their view is that antibiotic resistance is caused by overprescribing of antibiotics by physicians. It may be assumed that the perception of these PGPs towards antibiotics and resistance may be mirrored in the way they prescribe antibiotics. Hence, future research should focus on ascertaining associations between the rate of antibiotic prescribing and the physicians' perceptions of antibiotics and resistance. The rate of antibiotic prescribing was not investigated in this study.

In addition, this study found PGPs are influenced by the NSTG to prescribe antibiotics as most of them were in possession of the NSTG. This was contrary to a study conducted in Namibia on antibiotic use and resistance, where most of the respondents reported not having the Namibian standard treatment guidelines. That study had a response rate of 10% and was not exclusive to doctors in the private sector. The identified factors may assist in setting up focused antibiotic stewardship programs, and together with the development of Namibian antibiotic guidelines, they can motivate the expansion of the NSTG.

5.3.2 To determine the correlation between the demographic characteristics and the factors influencing antibiotic prescribing choices of private general practitioners in Windhoek

This study uncovered correlations between the demographic characteristics and the factors influencing the prescription of antibiotics among PGPs in Windhoek. Initially, a positive relationship was found between participants being pressured to prescribe antibiotics and their practice location ($r = 0.244$, $p < 0.05$). Secondly, a negative relationship exists between participants who fear losing patients due to lack of antibiotic prescription and the number of patients seen per day ($r= -0.211$, $p<0.05$). Finally, a positive relationship was found between the age group and the participants who use the Namibian standard treatment guidelines as their main source of information on antibiotics at ($r = 0.264$, $p< 0.05$). These results indicate that antibiotic stewardship programs and interventions may have to be tailored to accommodate certain groups such as the age of PGPs, location of practice and number of patients seen per day.

5.4 Study Limitations

The following study limitations must be considered:

- The time and availability of PGP to provide data were limited, hence this study achieved a response rate of 47%. This response rate is equal or in some cases higher than that of similar studies.
- Some Windhoek suburbs were excluded from the study because they had no practising general practitioner or were unable to partake in the study. For this reason, the generalization of the study to the entire Namibian general practitioners should be made with caution.
- The questionnaire was provided as self-administered; hence there was no opportunity to clarify any questions that may have been misunderstood.

5.5 Recommendations

This study suggests several recommendations to assist in reducing inappropriate antibiotic prescriptions. These recommendations are targeted toward the following institutions: the Ministry of Health and Social Services, the University of Namibia, and local private general practitioners in Namibia.

5.5.1 The Ministry of Health and Social Services

At the national level, the MoHSS may use the results of this study to develop and implement Namibia-specific antibiotic prescribing strategies, which promote the rational use of antibiotics and the development of Namibian antibiotic guidelines. The guidelines will reduce the reliance of PGP on prescribing antibiotics for mild or self-limiting conditions in the community.

In addition, this study unearthed the level of influence the NSTG has on the physicians in the private health sector. Hence the directorate of tertiary health care and clinical

support services is recommended for expanding the NSTG to include more antibiotics used in the private health sector.

At the community level, the division of primary health care services may engage the community by increasing awareness of when antibiotics should be used and the dangers of misuse.

5.5.2 The University of Namibia

To combine principles of appropriate antibiotic prescribing in their curriculum for medical students. This will increase the student's ability to implement antibiotic resistance prevention strategies within their own post-graduation practices.

5.5.3 Private general practitioners

PGPs are recommended to practice effective symptom management, to take time, and to explain non- antibiotic management of symptoms to patients. To decrease the use of antibiotics for non-antibiotic symptoms and when necessary, to choose an antibiotic that will limit the development of resistance in the patient.

5.6 Future research

The following are recommendations for future research:

- To determine the rate of antibiotic prescription among PGP in Namibia.
- A study on knowledge, attitudes, and practices of physicians on antibiotic prescribing.

5.7 Summary

This chapter presented the study's conclusions, limitations, and recommendations from the study findings. A quantitative descriptive cross-sectional research design was employed to determine the factors influencing antibiotic prescription among PGPs in Windhoek. Several factors were found to influence antibiotic prescribing namely, patient pressure to prescribe antibiotics, fear of losing the patient due to lack of antibiotic prescription, the perception of antibiotics and resistance of PGPs, advice from the medical representatives, fear of the patient developing a more serious infection and influence from the Namibian standard treatment guidelines. What is more, associations were found between the factors influencing antibiotic prescribing and the age, location of practice, and the number of patients seen daily. These results can be used to implement targeted strategies that promote the rational use of antibiotics necessary for preserving the efficacy of these lifesaving drugs.

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APPENDIX A: UNAM Ethical Clearance Certificate

UNAM
UNIVERSITY OF NAMIBIA

ETHICAL CLEARANCE CERTIFICATE

Ethical Clearance Reference Number: DEC OSH 0015 **Date:** 04/04/2022

This Ethical Clearance Certificate is issued by the University of Namibia Ethics Committee (REC) in accordance with the University of Namibia's Research Ethics Policy and Guidelines. Ethical approval is given in respect of undertakings contained in the Research Project outlined below. This Certificate is issued on the recommendations of the ethical evaluation done by the ethics committee.

Title of Project: FACTORS INFLUENCING ANTIBIOTIC PRESCRIBING CHOICE AMONG PRIVATE GENERAL PRACTITIONERS IN WINDHOEK

Principal researchers: HILENI PHILLIPS

Staff Number/ Student number: 200715798

Remarks: Low Risk - Approved

Centre for Research Services

Take note of the following:

1. Any significant changes in the conditions or undertakings outlined in the approved Proposal must be communicated to the ethics committee. An application to make amendments may be necessary.
2. Any breaches of ethical undertakings or practices that have an impact on ethical conduct of the research must be reported to the ethics committee
3. The Principal Researcher must report issues of ethical compliance to the ethics committee (through the Chairperson) at the end of the Project or as may be requested by the ethics committee
4. The ethics committee retains the right to:
   i) Withdraw or amend this Ethical Clearance if any unethical practices (as outlined in the Research Ethics Policy) have been detected or suspected,
   ii) Request for an ethical compliance report at any point during the course of the research.

The ethics committee wishes you the best in your research.

Prof Hans J Amukugo (Oshakati Campus Chairperson Decentralized Ethics Committee)

Prof. Davis Mumbengegwi (Head, Multidisciplinary Research)

APPENDIX B: UNAM Research Permission Letter

CENTRE FOR RESEARCH SERVICES
Office of the Pro-Vice Chancellor: Research, Innovation & Development
University of Namibia, Private Bag 13301, Windhoek, Namibia
340 Mandume Ndemufayo Avenue, Pioneers Park, Office 8241, Ebook, Second Floor
Tel: +264 61 206 3073; E-mail: ResearchServices@unam.na; URL: http://www.unam.edu.na

UNAM

RESEARCH PERMISSION LETTER

Date: 26/04/2022

Student Name: Hileni Phillips

Student Number: 200715798

Programme: MASTER'S DEGREE IN PUBLIC HEALTH

Approved Research Title: Factors influencing Antibiotic Prescribing choice among Private General Practitioners in Windhoek.

TO WHOM IT MAY CONCERN

Hereby confirm that the above-mentioned student is registered at the University of Namibia for the programme indicated. The proposed study met all the requirements as stipulated in the University guidelines and has been approved by the relevant committees.

The proposal adheres to ethical principles as per attached Ethical Clearance Certificate. Permission is hereby granted to carry out the research as described in the approved proposal.

Best Regards

Dr. ANN Shikongo
Head: Postgraduate Support Services
Tel: +264 61 206 3129
E-mail: anshikongo@unam.na

CENTRE FOR RESEARCH SERVICES
Office of the Director
2022 -04- 26
University of Namibia
UNAM

APPENDIX C: Ministry of Health and Social Services

Permission Letter

REPUBLIC OF NAMIBIA

MINISTRY OF HEALTH AND SOCIAL SERVICES

OFFICE OF THE EXECUTIVE DIRECTOR

Ministerial Building
Harvey Street
Private Bag 13198, Windhoek

Tel: No: 061 -203 2507
Fax No: 061-222 558
Andreas.Saipanga@mhss.gov.na

Ref: 17/3/3/ HP
Enquiries: Mr. A. Shipanga

Date: 24 May 2022

Ms. Hileni K. Phillips
PO Box 50201
Windhoek

Dear Ms. Phillips

Re: *Factors influencing antibiotic prescribing choice among private general practitioners in Windhoek.*

1. Reference is made to your application to conduct the above-mentioned study.
2. The proposal has been evaluated and found to have merit.
3. **Kindly be informed that permission to conduct the study has been granted under the following conditions:**
   - 3.1 The data to be collected must only be used for academic purpose;
   - 3.2 No other data should be collected other than the data stated in the proposal;
   - 3.3 Stipulated ethical considerations in the protocol related to the protection of Human Subjects should be observed and adhered to, any violation thereof will lead to termination of the study at any stage;
   - 3.4 A quarterly report to be submitted to the Ministry's Research Unit;
   - 3.5 Preliminary findings to be submitted upon completion of the study;
   - 3.6 Final report to be submitted upon completion of the study;
   - 3.7 Separate permission should be sought from the Ministry for the publication of the findings.
4. All the cost implications that will result from this study will be the responsibility of the applicant and not of the MoHSS.

Yours sincerely,

BEN NANGOMBE
EXECUTIVE DIRECTOR

All official correspondence must be addressed to the Executive Director

MoH NAMIBIA

APPENDIX D: Participant Consent Form

TITLE: FACTORS INFLUENCING ANTIBIOTIC PRESCRIBING CHOICE AMOUNG PRIVATE GENERAL PRACTITIONERS IN WINDHOEK.

Institutional contact: University of Namibia Research Ethics Committee

University of Namibia, 061-2063111

Investigator: Hileni Phillips

hilenip@yahoo.com

081 291 0252

Dear Participant

My name is Hileni Phillips, student number 200715798. I am studying towards a Master of Public Health degree at the University of Namibia (UNAM), and I am conducting a survey on the factors influencing antibiotic prescribing choice among private general practitioners in Windhoek.

You are being invited to take part in this research study. Participation in this study entails the reading, understanding and completion of this consent form. Please ask the investigator any questions about any part of this research study that you do not fully understand. Your decision to participate in this study is completely voluntary: you are under no obligation and may withdraw from the study at any point in time.

The research study has been approved by the Ministry of Health and Social Services' Ethical Committee as well as the University of Namibia's Research Ethical Committee. The purpose of this study is to uncover the factors influencing antibiotic prescribing choice among private general practitioners in Windhoek. This study is expected to provide valuable information on the antibiotic prescribing decisions of PGP. Hence the results of this study may be used to advise for the development of data- driven Namibia antibiotic guidelines and stewardship programs ultimately contributing to the fight against antibiotic resistance.

Participants to this study will be provided with a 10-15 min questionnaire either in hard copy or virtually whichever is most convenient for you to complete. Once

completed a hand delivered application may be handed back to the investigator and virtual applications are submitted online via google documents.

There are no known risks or harm that may come from participating in this study however, the research results add to a body of knowledge that benefits the entire society. Participants may determine the level to which they wish to share information. To ensure anonymity no personal identifying information such as names and practice numbers will be collected. Furthermore, the information collected will be kept in a secure place were only the investigator and assistant will have access to it. The information collected will be used for the purpose of the research study only.

Your decision to participate in this study is completely voluntary: you are under no obligation and may withdraw from the study at any point in time.

Declaration by participant

By signing below, I agree to take part in a research study entitled: FACTORS INFLUENCING ANTIBIOTIC PRESCRIBING CHOICE AMOUNG PRIVATE GENERAL PRACTITIONERS IN WINDHOEK

I declare that:

a) I have read or had read to me this information and consent form and it is written in

a language with which I am fluent and comfortable.

b) I understand that taking part in this study is voluntary and I have not been

pressurized to take part. I may choose to leave the study at any time and will not be penalized or prejudiced

in any way.

Signed at (place) .....…..……. on (date) ……...……...

……

Signature of participant

APPENDIX E: Data Collection Tool

UNIVERSITY OF NAMIBIA

SCHOOL OF PUBLIC HEALTH

STUDENT NAME: HILENI PHILLIPS

SUPERVISOR: DR. WASHINGTON SHUMBA

FACTORS INFLUENCING ANTIBIOTIC PRESCRIBING CHOICE AMONG PRIVATE GENERAL PRACTITIONERS IN WINDHOEK

Section 1: Demographic Information

1. Gender: Male ☐ Female ☐
2. Age group: 25 – 34 ☐ 35 – 44 ☐ 45 – 5 ☐ > 5 ☐
3. Location of Practice

Windhoek		Klein Windhoek	
Katutura		Dorado Park	
Eros		Hochland Park	
Khomasdal		Otjomuise	
Olympia		Auasblick	
Pioneers Park		Rocky crest	
Kleine Kuppe		Prosperita	

4. Length of practice as General Practitioner in years: _____
5. Length of practice in the private health sector in years:_____
6. How many patients do you see on average per day?

Less than 10	
11- 20	
21- 30	
31- 40	
41- 50	
51 and above	

Section 2: Factors influencing antibiotic prescribing choices

7. Do you think antibiotic resistance is a problem in Namibia?
   ☐ Yes ☐ No

8. In your opinion Antibiotic resistance is a result of? (Indicate all that apply)

Overprescribing	
Under prescribing	
Misuse by patients	
Use in animal husbandry	

Other _____

9. Is antibiotic resistance a problem that can affect your practice?

☐ Yes ☐ No

10. Do you fear losing patients due to lack of antibiotic prescription?

☐ Yes ☐ No

11. Have you ever been pressured to prescribe an antibiotic by a patient even when it was not indicated?

☐ Yes ☐ No

If yes what was the outcome? _____

12. Do you discuss the subject of antibiotic resistance with your patients when prescribing an antibiotic?

☐ Yes ☐ No

13. Do you fear the development of a serious infection, if you do not prescribe an antibiotic for a viral infection?

☐ Yes ☐ No

14. Please fill in the table below, for antibiotic treatment, what do you usually use as first line treatment?

Infection	Do routine Laboratory culture		Do lab culture when empirical treatment fails		Antibiotic treatment
	Yes	No	Yes	No	
Acute pharyngitis					
Acute sinusitis					
Bronchitis					
Pneumonia					
Cystitis					
Pyelonephritis					

15. Would you prescribe an antibiotic on the advice of a medical representative?

☐ Yes ☐ No

16. What do you think will improve antibiotic use in Namibia? (Indicate all that apply)

Antibiotic stewardship Program	
Antibiotic guidelines	
Change in Prescriber attitudes towards antibiotic use	
Appropriate antibiotic use training	

Other _____

17. Do you consider the cost of an antibiotic when prescribing?

☐ Yes ☐ No

18. What is your main source of information on antibiotics?

Laboratory data	
Namibian Standard Treatment Guidelines	
Medical Representatives	
CPD meetings	

19. Do you have a copy of the Namibian Standard Treatment Guidelines?

☐ Yes ☐ No

20. Do you think there is a need for Antibiotic guidelines in Namibia?

☐ Yes ☐ No

Thank you for taking time out to complete this questionnaire!

APPENDIX F: Supplementary Tables

Correlations between demographic characteristics of participants and the factors influencing antibiotic prescribing choice.

1. Correlations of demographic characteristics and pressure to prescribe antibiotic

	Pressured to prescribe an antibiotic by a patient	Age group	Location of Practice	Gender
Pressured to prescribe an antibiotic by patient	1			
Age group	0.127	1		
Location of Practice	0.244*	-0.102	1	
Gender	0.022	-0.109	-0.002	1

*. Correlation is significant at the 0.01 level (2-tailed).

2. Correlation between demographic characteristics and perception of participants on antibiotic resistance

	Gender	Age group	Location of Practice	In Your opinion Antibiotic resistance is a result of? Overs-prescribing	In Your opinion Antibiotic resistance is a result of? Under-prescribing	In Your opinion Antibiotic resistance is a result of? Misuse by patients	In Your opinion Antibiotic resistance is a result of? Use in animal husbandry
Gender	1						
Age group	-.109	1					
Location of Practice	-.002	-.102	1				
In Your opinion Antibiotic resistance is a result of?	.053	-.113	.140	1			

Over-prescribing							
In Your opinion Antibiotic resistance is a result of under-prescribing	-.017	-.148	.036	-.032	1		
In Your opinion Antibiotic resistance is a result of misuse by patients	.061	-.122	.009	-.222	-.015	1	
In Your opinion Antibiotic Resistance is a results of animal husbandry	-.045	-.076	-.025	-.024	.407**	.040	1

3. Correlation between demographic characteristics and fear of losing patients due to lack of antibiotic prescription

	Fear losing patients due to lack of antibiotic prescription	Location of Practice	Gender	Age group	Patients seen on average
Fear losing patients due to lack of antibiotic prescription	1				
Location of Practice	-0.150	1			
Gender	0.047	-0.002	1		
Age group	-0.041	-0.102	-0.109	1	
Patients seen on average	-0.211*	0.017	0.012	-0.071	1

*. Correlation is significant at the 0.01 level (2-tailed).

4. Correlation between demographic characteristics and fear of patient developing a serious infection due to lack of antibiotic prescription

	Gender	Age group	Location of Practice	Do you fear the development of a serious infection, if you do not prescribe an antibiotic for viral infection?
Gender	1			
Age group	-0.109	1		
Location of Practice	-0.002	-0.102	1	
Do you fear the development of a serious infection, if you do not prescribe an antibiotic for viral infection?	-0.173	-0.031	0.002	1

5. Correlation between demographic characteristics and participants who would prescribe antibiotics on the advice of medical representative

	Gender	Age group	Location of Practice	Prescribe an antibiotic on the advice of a medical representative
Gender	1			
Age group	-0.109	1		
Location of Practice	-0.002	-0.102	1	-
Patients seen on average	0.012	-0.071	0.017	
Prescribe an antibiotic on the advice of a medical representative	-0.071	0.130	-0.090	1

6. Correlation between demographic characteristics and participants influence from NSTG to prescribe antibiotics

	Gender	Age group	Location of Practice	What is your main source of information on antibiotics, Laboratory data	What is your main source of information on antibiotics, Namibia standard treatment	What is your main source of information on antibiotics, Medical Representatives	What is your main source of information on antibiotics, CPD meetings
Gender	1						
Age group	-.109	1					
Location of Practice	-.002	-.102	1	.			
What is your main source of information on antibiotics, Laboratory data	-.124	.009	.161	1			
What is your main source of information on antibiotics, Namibia standard treatment	.094	.264*	-.103	-.339**	1		
What is your main source of information on antibiotics, Medical Representatives	.006	.163	.050	-.063	.102	1	
What is your main source of information on antibiotics, CPD meetings	-.212	-.049	.000	.305**	-.284*	.078	1

**. Correlation is significant at the 0.01 level (2-tailed).

APPENDIX G: Turnitin similarity report

HILENI PHILLIP_ FACTORS INFLUENCNG ANTIBIOTIC PRESCRIBING CHOICE AMONG PRIVATE GENERAL PRACTITIONERS IN WINDHOEK

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